Remarks

Claims 1-6 were pending in the application. Claims 1-6 were rejected. Claims 7-20 are added. Claims 1-20 are now pending. Claims 1 and 2 are the independent claims. Reconsideration of the amended application is respectfully requested.

The examiner rejected claims 1-6 under 35 USC §101 as being directed to non-statutory subject matter. The examiner asserted that the claimed invention does not produce a useful result. In particular, the examiner asserted that "accessing said data elements" does not necessarily result in the data elements being displayed to a user or provided to an output device.

It is respectfully submitted that access to data is a useful result, and that display of data to a user is not necessary for access to be useful. "Accessing" of data in the computer sense can encompass a broad range of actions, as understood by those of skill in the art, including making the data available for processing by an application, giving read and/or write control to the data, and allowing the copying of the data, all of which are useful and none of which require display of the data to the user or provision of the data to an output device. For example, the On-Line Computer, Telephony, and Electronics Glossary and dictionary at http://www.csgnetwork.com/glossarya.html#access defines "access" as follows:

access

1. The rights granted a user in a **network**. See **authorization** and **authentication**.

2. The ability to read, write, or update information (data) on some recording media such as disks; it can be a noun or a verb.

3. A Microsoft product that has become a standard for small **database applications**. Part of the Microsoft **Office** suite of programs.

Of course, providing the data to an output device such as a display or printer is also understood to fall within the scope of "access", but this is a particular example to which the claimed invention need not be limited in order for it to be useful. New claims 7-16 are added as dependent claims reciting particular examples of "accessing" in order to specifically protect these particular useful examples.

As stated in the written description on page 5, at lines 1-3, an object of the claimed invention is to organize multidimensional data according to a Hilbert curve to allow shorter access times to data stored in the system. As also noted in the written description, for example on page 6, at lines 24-33, the database system of the invention overcomes a problem of conventional database systems, namely, an advantageous means for accessing next multidimensional data in a query. Clearly, this is a practical application that provides a useful result. The quick access of data is a specific, substantial, and credible utility recognized by those of skill in the art, and provides a tangible and intended result of the specifically-recited organization of data elements according to the claimed database system. It is respectfully submitted that this post-solution activity renders claim 1 as patentable subject matter under 35 USC §101. The rejection of claim 1, therefore, should be withdrawn.

Likewise, claim 2 recites a method of organizing data elements of a database according to a Hilbert curve. Claim 2 is amended to recite the act of accessing the data elements. As stated in the written description on page 5, at lines 1-3, an object of the claimed invention is to organize multidimensional data according to a Hilbert curve to allow shorter access times to data stored in the system. As also noted in the written description, for example on page 6, at lines 24-33, the database system of the invention overcomes a problem

of conventional database systems, namely, an advantageous means for accessing next multidimensional data in a query. Clearly, this is a practical application that provides a useful result. The quick access of data is a specific, substantial, and credible utility recognized by those of skill in the art, and provides a tangible and intended result of the specifically-recited organization of data elements according to the claimed database system. It is respectfully submitted that this post-solution activity renders claim 2 as patentable subject matter under 35 USC §101. Claims 3-6 depend from claim 2, and therefore recite patentable subject matter as well. The rejection of claims 2-6, therefore, should be withdrawn.

The examiner rejected claims 1-6 under 35 USC §103(a) as being unpatentable over Lawder et al., in view of Pruett et al.

Independent claim 1 recites a database system for organizing data elements according to a Hilbert curve. The data elements are representable by a plurality of coordinates. The database system includes first means for generating a plurality of bitblocks by bitwise interleaving the coordinates of the data elements, second means for applying a fliprot transformation to a first bitblock, third means for obtaining, for each further bitblock, a fliprot transformation by a concatenation of two or more fliprot transformations, fourth means for applying fliprot transformations to their corresponding bitblock, and fifth means for accessing the data elements. The fliprot transformation includes a flip transformation and a rotation transformation, such that the flip transformation inverts bits of the first bitblock and the rotation transformation interchanges bits of the first bitblock. The bitblock bits determine the organization of the data elements according to the Hilbert curve.

Similarly, independent claim 2 recites a method of organizing data elements of a database according to a Hilbert curve. The data elements are representable by a plurality of coordinates. According to the claimed method, a plurality of bitblocks is generated by bitwise interleaving the coordinates of the data elements. A predetermined fliprot transformation is applied to a first bitblock. For each further bitblock, a fliprot transformation is obtained by a concatenation of two or more fliprot transformations. Fliprot transformations are applied to their corresponding bitblock, and the data elements are accessed. The fliprot transformation includes a flip transformation and a rotation transformation. The flip transformation inverts bits of the first bitblock and the rotation transformation interchanges bits of the first bitblock. The bitblock bits determine the organization of the data elements according to the Hilbert curve.

In contrast, Lawder et al. disclose a system for querying data indexed according to a Hilbert space-filling curve. Lawder et al. either use precompiled state transition diagrams, or perform a direct calculation that requires iteration. Instead, the claimed invention makes use of a fliprot representation and its very simple concatenation transform. According to the claimed invention, a fast noniterative calculation is performed by means of a simple concatenation of a fliprot representation, and precompiling does not make much sense in this context. Thus, Lawder et al. do not disclose this aspect of the claimed invention.

The examiner acknowledged that Lawder et al. do not disclose means for applying a fliprot transformation to a bitblock, but stated that Pruett et al. teach this feature and asserted that it would have been obvious to have modified the Lawder et al. system in view of the Pruett et al. method to provide the claimed invention.

As recited in claims 1 and 2, the fliprot transformation includes a flip transformation and a rotation transformation, such that the flip transformation inverts bits of the first bitblock and the rotation transformation interchanges bits of the first bitblock. That is, the claimed flip is an inversion, so that the places remain constant while the values are inverted (1 to 0 and 0 to 1). See, for example, Fig. 4 and the description at page 15, lines 23-27. The claimed rotation is a one-dimensional shift with a wrap-around, in the sense of a rotation command in a programming language. See, for example, page 15, line 29 through page 16, line 2. The claim language clearly recites that the flip transformation inverts bits and the rotation transformation interchanges bits.

In contrast, the Pruett et al. method rotates binary image data by 90 degrees. See column 2, line 45 through column 3, line 6. The claimed invention transforms the data, whereas Pruett et al. merely transpose data in order to "flip" a resulting image. As shown in Figs. 3.1 and 3.2 and described at column 4, lines 49-55, the Pruett et al. "flip" consists of swapping bits about an axis after transposing them, or performing the axis-wise swap before transposing the bits, depending on the desired direction of rotation of the image. In contrast, as clearly recited in the claims, the claimed flip transformation inverts bits of the bitblock, it does not swap them about an axis. The Pruett et al. "flip" operation has the structure A:=f(A), whereas the claimed flip transformation is of the structure A:=f(A,B). Pruett et al. describe something called a "flip", but it is completely different that the claimed flip transformation.

Further, the "rotation" described by Pruett et al. is not a separate operation, but is merely a description of the result of the "flip" operation after or before transposition of bits. See Figs. 3.1 and 3.2 and the description at column 4, lines 49-52. It is a geometrical rotation

in a two-dimensional plane, which satisfies the objective of the Pruett et al. invention, that is, to rotate an image by 90 degrees. According to Pruett et al., transposition followed by a "flip" results in a counter-clockwise rotation, and a "flip" followed by transposition results in a clockwise rotation. The Pruett et al. method that includes the disclosed "flip" results in the rotation of a matrix of data, but Pruett et al. does not disclose or suggest a rotation transformation that is separate from a flip transformation, and does not disclose or suggest the rotation transformation recited in claims 1 and 2.

Thus, neither cited reference discloses the fliprot transformation recited in claims 1 and 2. For at least the reasons noted above, no combination of the teachings of Lawder et al. and Pruett et al. could render obvious the invention as recited in claims 1 and 2. Claims 3-6 depend from claim 2, and therefore also are not rendered obvious by the cited references. The rejection of claims 1-6, therefore, should be withdrawn. New claims 17-20 are added to recite specific details of the claimed fliprot transformation.

In the advisory action dated May 2, 2007, the examiner stated that "accessing" does not meet the requirements of 35 USC §101 as not having a clear tangible result. In response, it is noted that claim 1 is an apparatus claim, and a clear tangible "result" is not required. Also as noted above, "accessing" can include the ability to read, write, or update data. Accordingly, new claim 7 recites that the fifth means for accessing said data elements of the database system of claim 1 includes means for loading said data elements into RAM to be used by a local application. Likewise, claim 8 recites that the fifth means for accessing said data elements includes means for providing said data elements to an output device, and claim 9 recites that the fifth means for accessing said data elements includes means for providing said data elements to at least one of a display device and a printing device. Claim 10 recites

that the fifth means for accessing said data elements includes means for at least one of reading, writing, and modifying said data elements. Claim 11 recites that the fifth means for accessing said data elements includes means for copying said data elements to a memory device.

Addressing the method claims, new claim 12 recites that accessing said data elements in the method of claim 2 includes loading said data elements into RAM to be used by a local application. Likewise, claim 13 recites that accessing said data elements includes providing said data elements to an output device, and claim 14 recites that accessing said data elements includes providing said data elements to at least one of a display device and a printing device. Claim 15 recites that accessing said data elements includes at least one of reading, writing, and modifying said data elements. Claim 16 recites that accessing said data elements includes copying said data elements to a memory device. New claims 7-11 all recite more details of the claimed apparatus, and claims 12-16 all recite clear tangible results.

The examiner also asserted that Pruett et al. teach the claimed flip and rotation transformations. As support for this assertion, the examiner cited a dictionary definition of the word "invert". While the definitions might provide evidence of the common meanings of those words, it is important to note that what is claimed includes "flip transformation" and "rotate transformation", which are terms of art as defined by the applicant. Further, the claims do not recite "inverting bits of the first bitblock." Rather, claim 17 recites that inverting bits of said first bitblock includes inverting values of the bits of said first bitblock. Pruett et al. do not disclose or suggest inversion of bit values, which is not the same as inversion of bits, as explained above (for example, in a binary system, inversion of a bit that has a value of 0 would result in a value of 1 for that bit). Likewise, claim 18 recites that

interchanging bits of said first bitblock includes performing a one-dimensional shift of the bits of said first bitblock; claim 19 recites that inverting bits of said first bitblock includes inverting values of the bits of said first bitblock; and claim 20 recites that interchanging bits of said first bitblock includes performing a one-dimensional shift of the bits of said first bitblock. Pruett et al. do not disclose or suggest any of these claimed features.

It is respectfully submitted that all rejections have been overcome. It is therefore requested that the Amendment be entered, the claims allowed, and the case passed to issue.

Respectfully submitted,

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